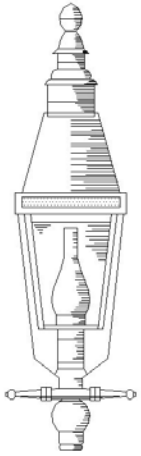


# Concord Municipal Light Board

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Enterprise Funds Hearing  
March 23, 2009



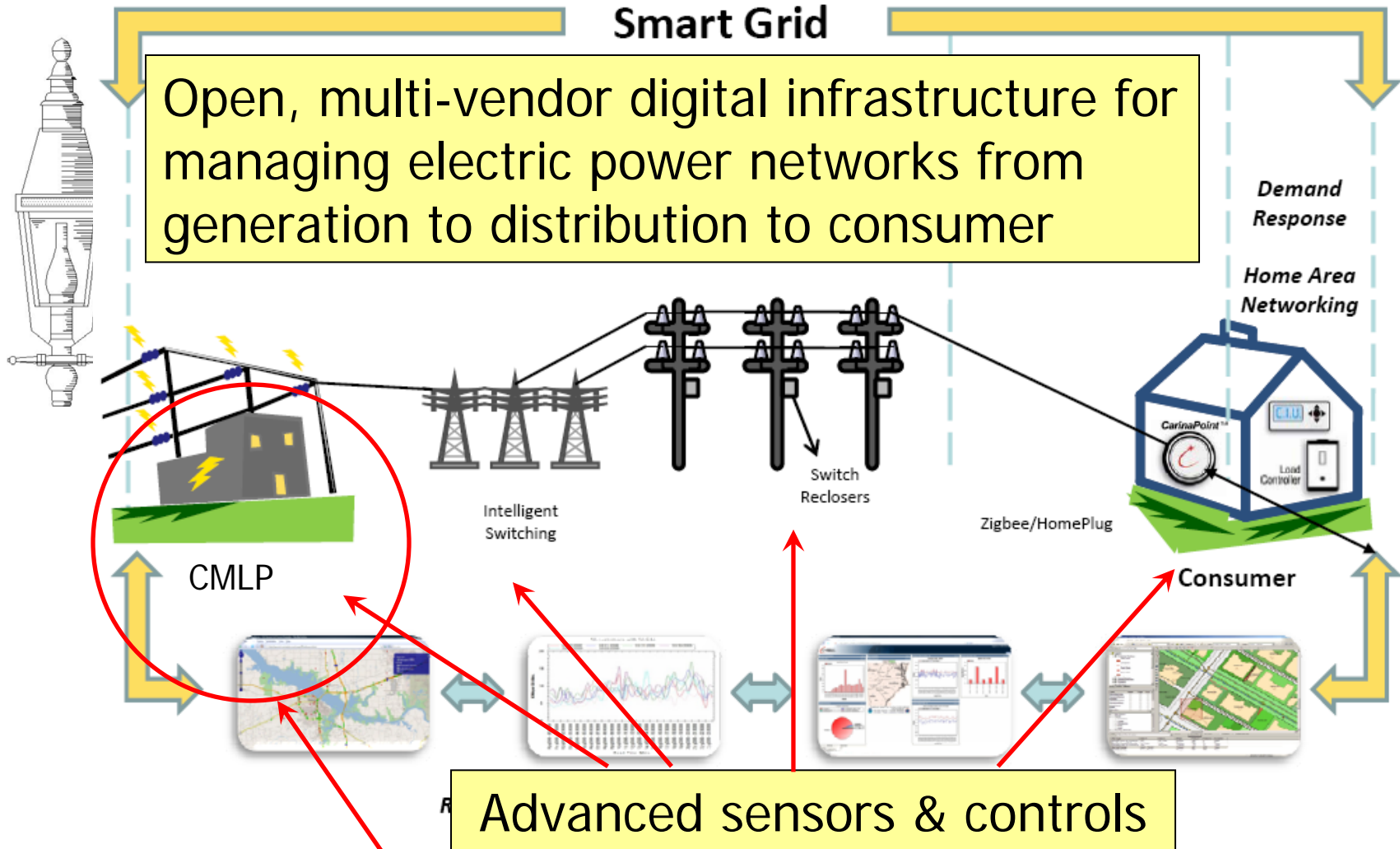
# Warrant Article 20

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- \$4.5 million bond authorization to deploy SmartGrid
  - To be repaid from Municipal Light Fund
- To be financed from savings realized from
  - (largely) reductions in *peak demand* for electricity, and
  - (in part) active management of *power factor* and of the distribution system

## Smart Grid

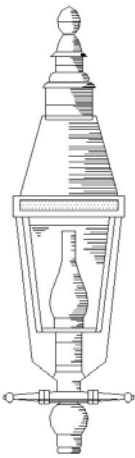
Open, multi-vendor digital infrastructure for managing electric power networks from generation to distribution to consumer



Computers and control software at operations center

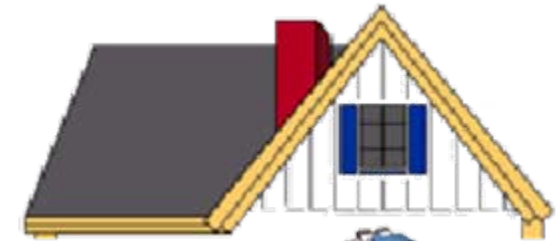
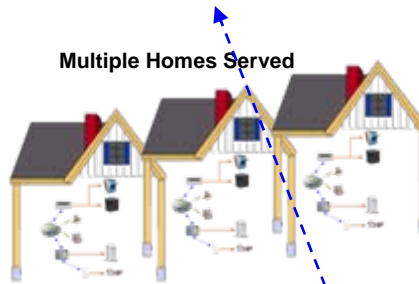
March 23, 2009

20 – SmartGrid  
Deployment



Wireless connections to devices  
being controlled or managed

Multiple Homes Served



Heat



AC Compressor



Smart  
Thermostat



Hot Water  
Heater



240 VAC  
Smart Relay



120 VAC  
Smart Relay



Pool Pump

Smart Controller

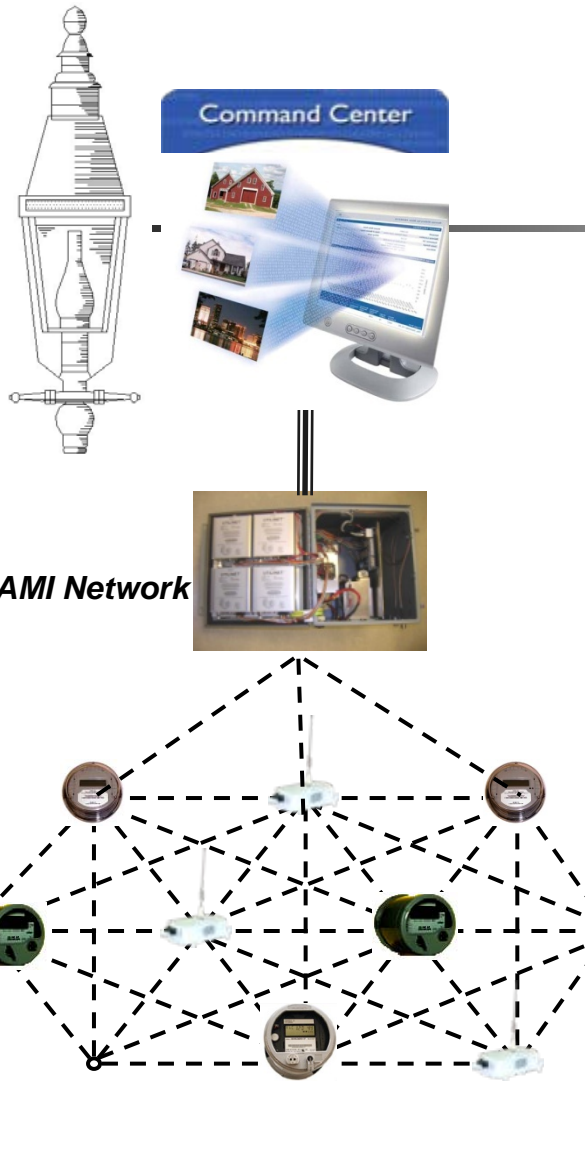
Broadband fiber  
optic connection to  
*each* transformer

Controller at each transformer  
serves multiple homes

March 23, 2009

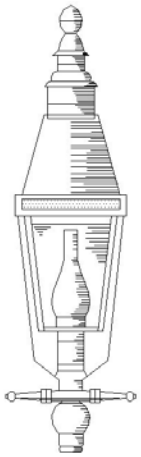
Article 20 – SmartGrid  
Deployment

# SMART GRID NETWORK OVERVIEW



Information to empower consumers to manage energy better and reduce costs

# LOAD CONTROL DEVICES AND APPLICATIONS



Zigbee IHD



Zigbee IHD



## LEDs Indicate Rates

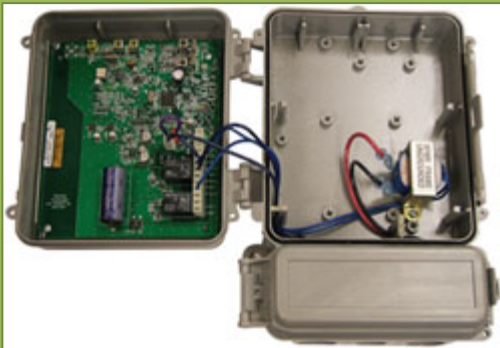
**Green:** Off Peak rates in effect

**Amber:** Mid Peak rates in effect

**Red:** Peak rates in effect

Flashing LED: 5 minutes from next rate, color will indicate next price level

Zigbee 30A Relay

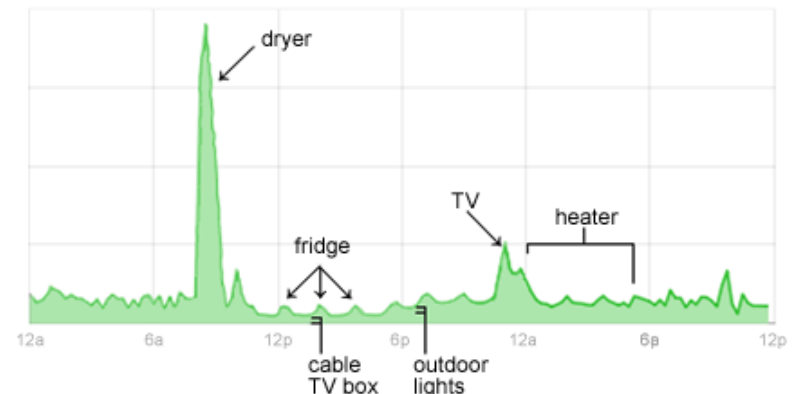


Zigbee PCT

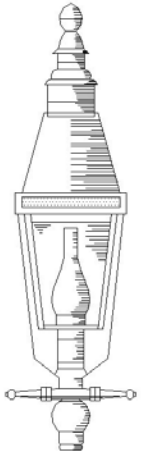


Google "PowerMeter"

## Home Electricity Use



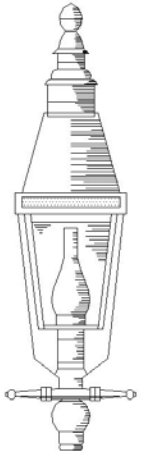
Note: labels in this graph are demonstrative, and are not part of PowerMeter's current design.



# What we will do with it

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- Manage peak demand
  - big component of our costs
  - big sources of savings
- Help ordinary users improve their own energy conservation and usage
- Improved monitoring and supervisory control of Concord's local electric grid

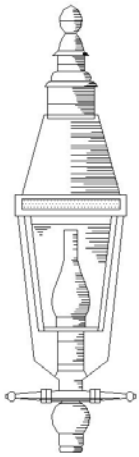


# What else we will do with it

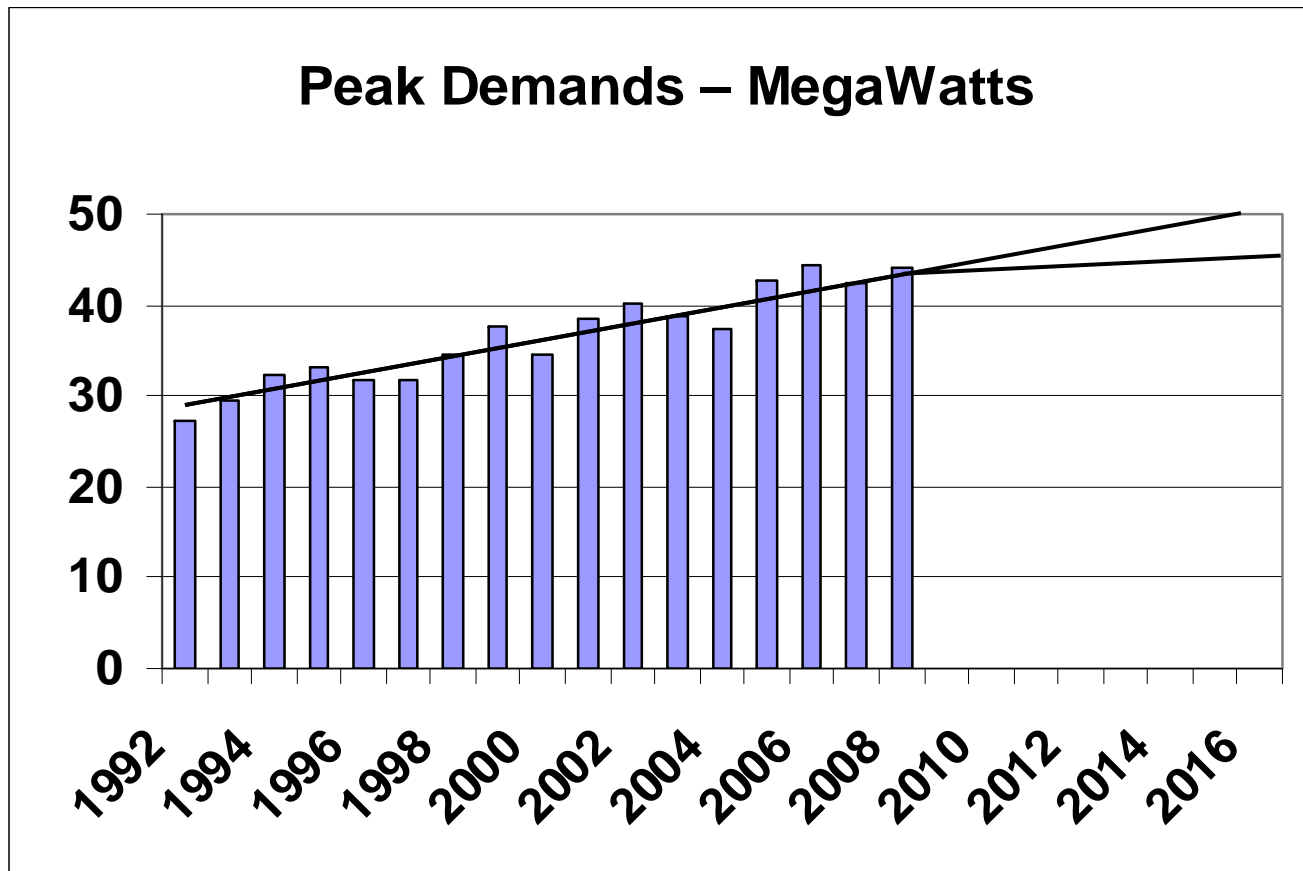
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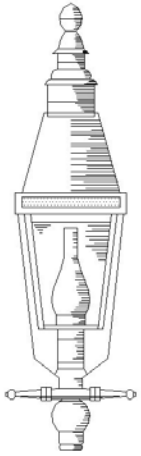
- Replace existing QEI system serving residential hot water heater and ETS users
  - Obsolete; parts no longer available



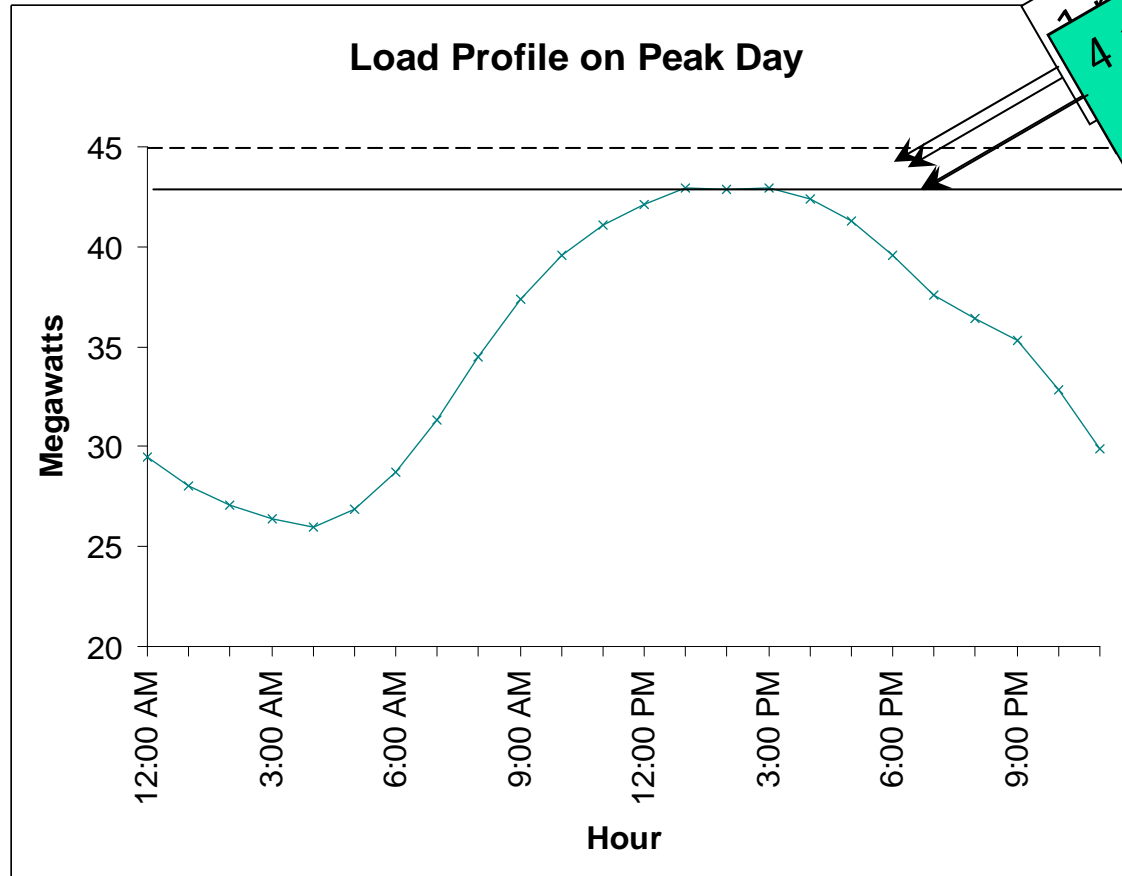


# Peak demand (continued)

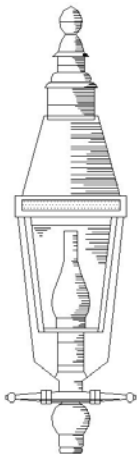




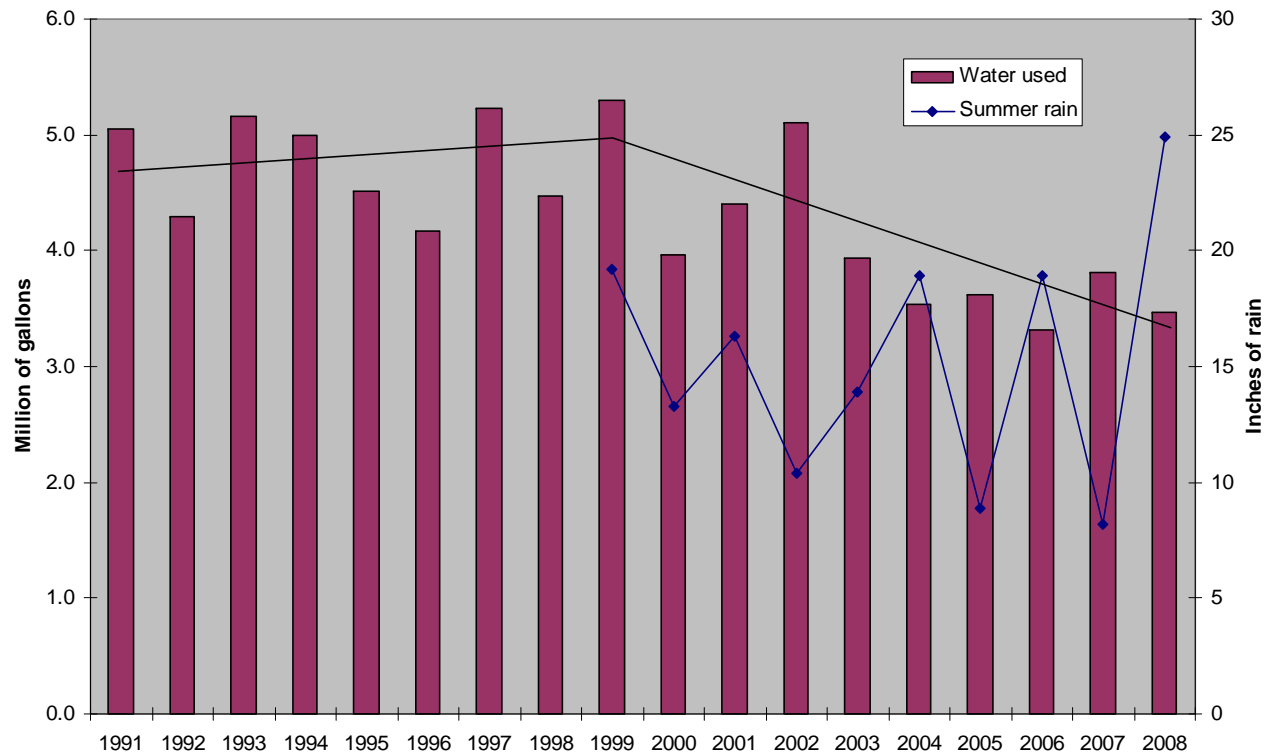
# Peak Load Profile (detail)

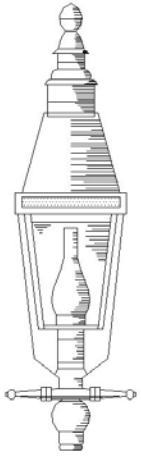


4 megawatts =  
\$480,000/year  
(full debt service)



# Peak Daily Water Usage

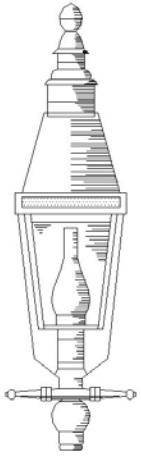




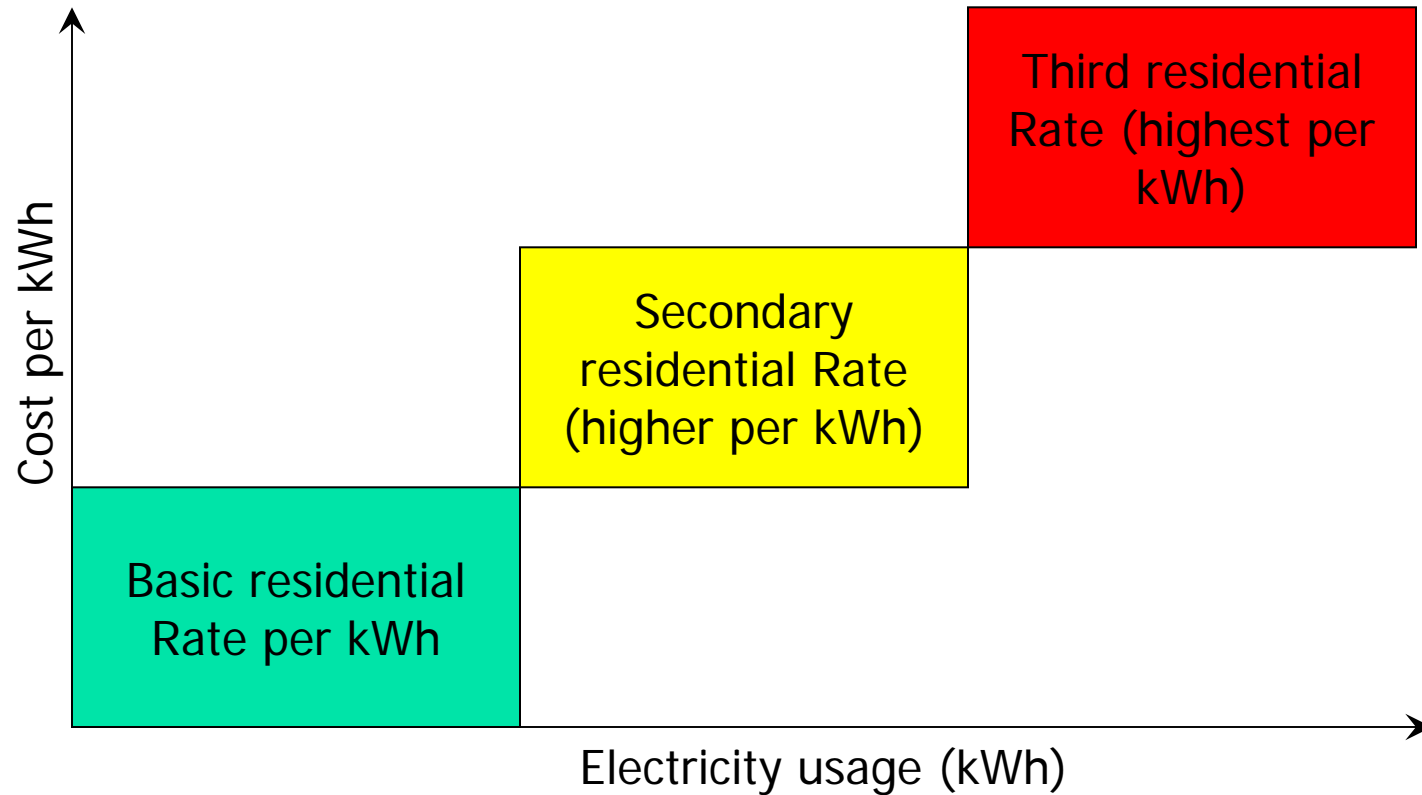
# Conservation

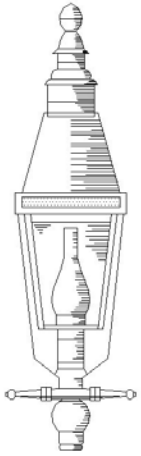
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- *Conservation-based rates* work ...
- ... *IF* ratepayers have the tools to work with them



# Multi-tiered Conservation Electricity Rate

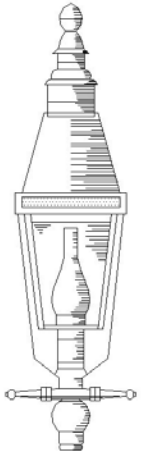




# What does a resident do?

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- Smart Meter for time-of-day billing
- Remote control of central A/C
  - Similar to remote control of ETS heating

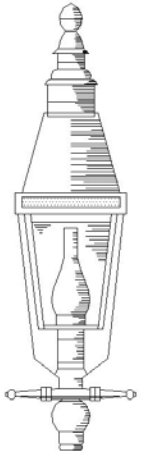


# What else can SmartGrid do?

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Manage charging of  
plug-in hybrid or  
electric vehicles



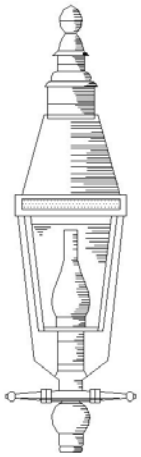


# What else can SmartGrid do?

---

- Internal operations
  - System Control and Data Acquisition (SCADA)
  - Automated detection of faults and problems
  - Power factor management



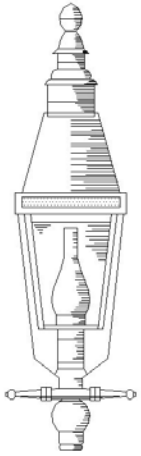


# Cost

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Construction, labor, etc.	\$2.10 m
Materials and systems	1.75 m
Engineering services	.15 m
QEI replacement equipment	.20 m
Contingency	<u>.30 m</u>
Total	\$4.50 m

- Initial impact on Electricity Rates
  - ¼ cent per kWh, offset by peak demand savings
  - Approx \$1.94 per month on median residential bill



# SmartGrid Summary

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- Saves real money
- Defers a new transformer
- Helps customers become more energy conscious
- Helps CMLP automate its own operations